OPTIMUM®
MASCHINEN - GERMANY

Operating Manual

Version 1.0.1

Digital Read Out

DPA 31

Item no. 3384030

Item no. 3384031

3384030

3384031

EN

1 Safety

1.1 Safety instructions 4
    1.1.1 Safety and warranty informations....4
1.2 Intended use 4
1.3 Identification of danger and notes....4
    1.3.1 Danger classes....4
1.4 Target group 5
1.5 Basic safety information....5

2 Installation

2.1 Variants....6
2.2 Scope of delivery 6
2.3 Mechanical installation....6
2.4 Electrical installation 8
2.5 Power supply speed sensor....8
    2.5.1 Reader signal plug pinout 9
2.6 Installation of magnetic sensor and magnetic strip....10
    2.6.1 Installation steps 10
    2.6.2 Installation examples....11
    2.6.3 Mounting the magnetic sensor 11
    2.6.4 Trouble shooting 12
2.7 Installation of ML measuring gibs 13
    2.7.1 Assembly of the measurement gib housing 14
    2.7.2 Assembly of the reading head....14
    2.7.3 Trouble shooting 15
2.8 Installation of ball scales....16
    2.8.1 Assembly of the ball scales....16
    2.8.2 Installation examples....17
    2.8.3 Necessary measures 17

3 Operation DPA31

3.1 Parameter settings....18
    3.1.1 Explanation of the Parameters....19
3.2 Description of the Keys....20
3.3 Reference marker function 23
3.4 Machine zero point function....23
3.5 Calculator function 24
3.6 Functions for milling machines 25
    3.6.1 Coordinate points along a diagonal line 25
    3.6.2 Coordinate Points on a Circle or Arc....26
    3.6.3 Inclined Plane....29
    3.6.4 Arc....30
3.7 Functions for milling machines and lathes....33
    3.7.1 Tool Data Function....33
    3.7.2 Recall of tool data 33

4 Appendix

4.1 Copyright 34
4.2 Liability claims/warranty....34
4.3 Advice for disposal / Options of reuse: 35
    4.3.1 Decommissioning....35
    4.3.2 Disposal of new device packaging 35
    4.3.3 Disposal of the old device 35
    4.3.4 Disposal of electrical and electronic components 35
4.4 Disposal via municipal collection facilities 36
4.5 Change information manual....36
4.6 Product follow-up 36

Preface

Dear customer,

Thank you very much for purchasing a product made by OPTIMUM.

OPTIMUM metal working machines offer a maximum of quality, technically optimum solutions and convince by an outstanding price performance ratio. Continuous enhancements and product innovations guarantee state-of-the-art products and safety at any time.

Before commissioning please thoroughly read these operating instructions and get familiar with the device. Please also make sure that all persons operating the device have read and understood the operating instructions beforehand.
Keep these operating instructions in a safe place nearby the machine.

Information

The operating instructions include indications for safety-relevant and proper installation, operation and maintenance of the device. The continuous observance of all notes included in this manual guarantee the safety of persons and of the machine.

The manual determines the intended use of the device and includes all necessary information for its economic operation as well as its long service life.

The illustration and information included in the present manual can possibly deviate from the current state of construction of your device. Being the manufacturer we are continuously seeking for improvements and renewal of the products. Therefore, changes might be performed without prior notice. The illustrations of the device may be different from the illustrations in these instructions with regard to a few details. However, this does not have any influence on the operability.
Therefore, no claims may be derived from the indications and descriptions. Changes and errors are reserved!

Your suggestion with regard to these operating instructions are an important contribution to optimising our work which we offer to our customers. For any questions or suggestions for improvement, please do not hesitate to contact our service department.

If you have any further questions after reading these operating instructions and you are not able to solve your problem with a help of these operating instructions, please contact your specialised dealer or directly the company OPTIMUM.

Optimum Maschinen Germany GmbH
Dr.- Robert - Pfleger - Str. 26
D-96103 Hallstadt
Fax (+49)0951 / 96555 - 888
Email: info@optimum-maschinen.de
Internet: www.optimum-machines.com

1 Safety

1.1 Safety instructions

1.1.1 Safety and warranty informations

- In order to carry out installation correctly, we strongly recommend this document is read very carefully. This will ensure your own safety and the operating reliability of the device.
- Your device has been quality controlled, tested and is ready for use. Please respect all warnings and information which are marked either directly on the device or in this document.
- Warranty can only be claimed for components supplied by Optimum Maschinen Germany GmbH. If the DRO is used together with other products, the warranty for the complete system is invalid.
- Repairs should be carried out only at our works. If any information is missing or unclear, please contact Optimum Maschinen Germany GmbH.

1.2 Intended use

Combined with external sensors, the DRO represents a high-precision measuring system. The electronic display serves exclusively for processing and indicating position and rotational speed values.

Observe all safety instructions contained herein.

- Arbitrary modifications and changes to this electronic display are forbidden.
- Observe the prescribed operating and installation conditions.
- Operate the electronic display exclusively within the technical data and the specified limits.

1.3 Identification of danger and notes

Safety notes consist of a signal sign and a signal word.

1.3.1 Danger classes

Symbol	Alarm expression	Definition / consequence
⚠	**DANGER!**	Immediate danger that may cause irreversible bodily harm resulting in death, property damage or unplanned device reactions if you disregard the instructions given.
	WARNING!	Danger that may cause irreversible bodily harm, property damage or unplanned device reactions if you disregard the instructions given.
	CAUTION!	Danger that may cause minor injury, property damage or unplanned device reactions if you disregard the instructions given.
✋	**ATTENTION!**	Important operating information that may facilitate operation or cause unplanned device reactions if disregarded including possible property damage.
ℹ	INFORMATION	Application tips and other important/helpful or useful information and notes. No dangerous or harmful consequences for people or objects.

1.4 Target group

Installation instructions and user manual are intended for the engineering, commissioning and installation personnel of plant or machine manufacturers. This group needs profound knowledge of an position indicator's necessary connections of a electronic display and its integration into a complete machinery.

WARNING!

Insufficiently qualified personnel

Insufficiently qualified personnel cause personal injury, serious damage to machine or actuator.

- Configuration, commissioning, mounting and maintenance by trained expert personnel only.
- This personnel must be able to recognize danger that might arise from mechanical, electrical or electronicequipment.

Qualified Personnel

are persons who

- are familiar with the safety guidelines of the electrical and automation technologies when performing configuration tasks;
- are authorized to commission, earth and label circuits and devices/systems in accordance with the safety standards.

1.5 Basic safety information

DANGER OF EXPLOSION!

Do not use the electronic display in explosive zones.

Identification

The rating plate shows the model name with model number and serial number.

2 Installation

2.1 Variants

- designed to display 2 axes on machines.
- designed for displaying 3 axes on machines.

2.2 Scope of delivery

- Digital read out
- Mount
- External power supply
- Rotation speed sensor, without commercially available permanent magnets as a signal transducer.

2.3 Mechanical installation

CAUTION!

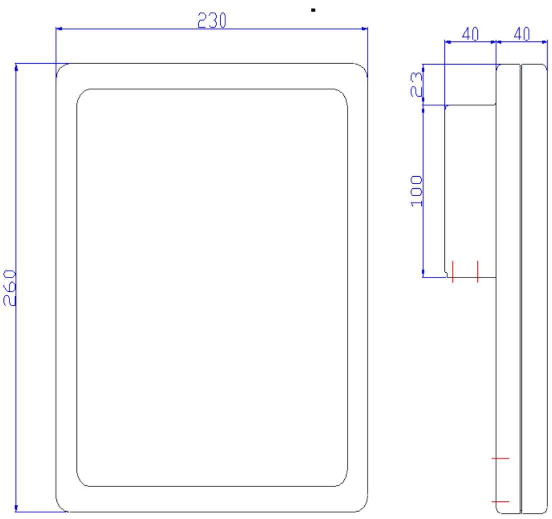
Failure of electronic display

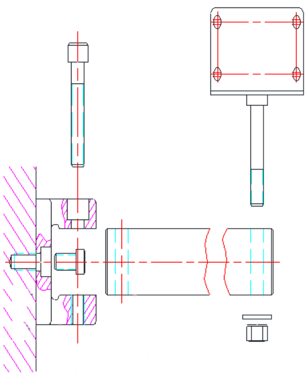
- When mounting pay attention to the IP type of protection.
- Avoid impact on the device.
- Do not modify the device in any way.

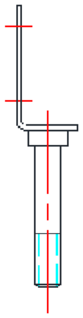
Assembly:

Screw the device in place on the fixture using the threaded holes (spacing 60 x 25mm - 4x M4, 7 deep) on the back.

Device dimension: height 260mm, width 230mm, depth 80mm







2.4 Electrical installation

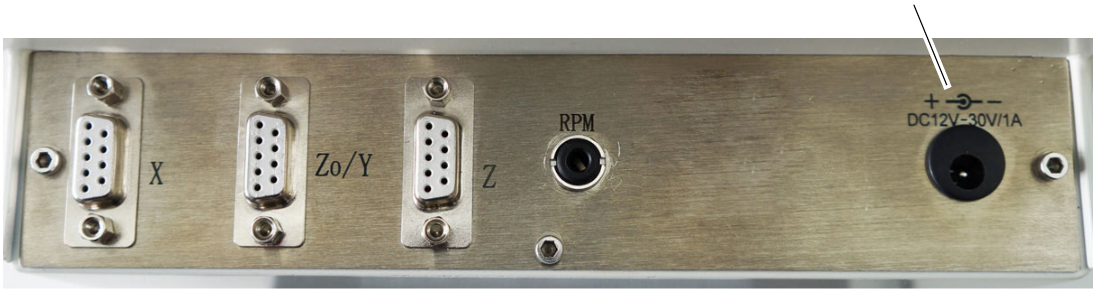
WARNING!

Destruction of parts of equipment and loss of regulation control

Check all line connections and plug connections before switching on supply voltage.

ATTENTION!

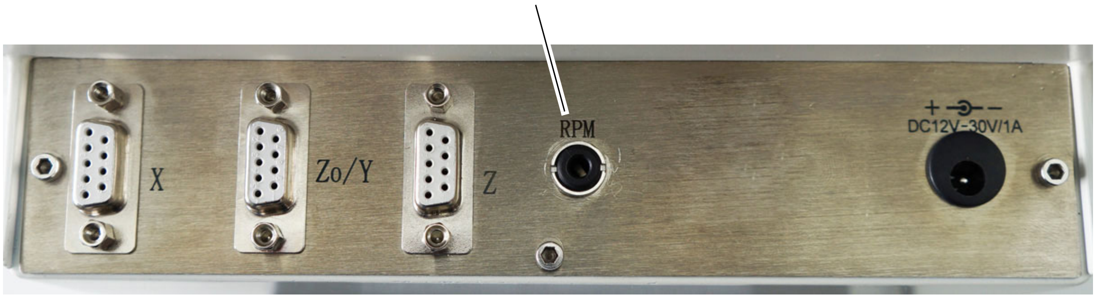
Basically, all connections are protected against external interference. Choose a place of operation that excludes inductive or capacitive interference influences on the electronic display or its connecting lines. When mounting the system keep a maximum possible distance from linesloaded with interference. If necessary, provide additional installations including screening shields or metallized housings. Contactor coils must be wired with spark suppression.


Power supply connection

Working temperature	0 °C ... +40 °C
Storage temperature	-30 °C ... +70 °C
Humidity	90 % at 20°C + - 5°C maximum
Protection type	IP51
Weight	2.5 Kg
Electrical data:	
Power supply Power supply unit	12 V to 30 V DC 230V
Current consumption	~ 5W

2.5 Power supply speed sensor

Power is supplied via the rear jack plug. Connect the sensor for speed measurement from the scope of delivery with the electronic display.

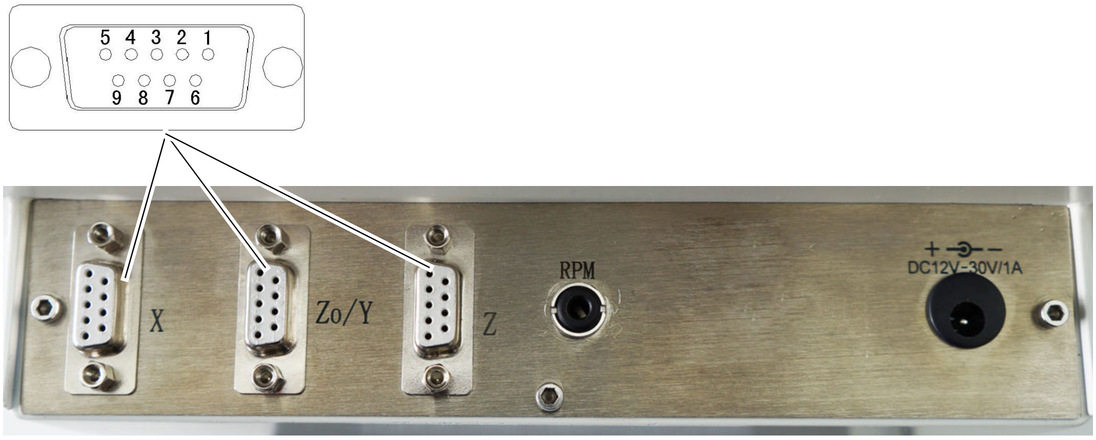

Speed sensor connection

2.5.1 Reader signal plug pinout

INFORMATION

The digital position display is designated for the operation with measuring devices which provide a TTL differential (TTL square wave) signal or a magnetic grating signal and a ball grid signal. We recommend the application of original measuring gibs and magnetic measuring systems from OPTIMUM.

If the digital display is to be operated with measuring devices from other manufacturers, pay attention that this measuring gib provides an output signal of one of the two signal types and the pin assignment is consistent with the following table.



PIN No.	1	2	3	4	5	6	7	8	9	Shells
TTL differential signal for ML glass measuring gibs and active read head for magnetic strips .	Blank	Z+	Select signal +	B+	B-	0V	+5V	A+	A-	Shielding
Ball grid signal for ball scales	+12V	E+	Blank	E-	S	0V	Blank	Blank	Blank	Shielding

Note (select signal +): DPA31 can identify the signal types automatically by this select signal.

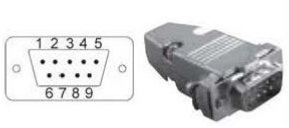
2.6 Installation of magnetic sensor and magnetic strip

INFORMATION

When using magnetic strips with the DPA31, an active reading head is needed.

Part no. 338 3934

Plug pinout TTL differential signal



PIN No.	1	2	3	4	5	6	7	8	9	Shells
TTL differential signal	Blank	Z+	Select signal	B+	B-	0V	+5V	A+	A-	Shielding

Installation may only be carried out in accordance with the specified IP protection. If necessary the system must be protected against environmental influences, such as sprayed water, solvent, dust, shocks, vibrations, temperature fluctuations.

The mounting surface / measuring track must be flat. Buckles or bumps will lead to measuring inaccuracies.

For technical reasons the strip should be approx. 30mm longer than the actual measuring distance.

ATTENTION!

For an optimum of adhesion, all anti-adhesive substances (such as oil, grease, dust etc.) must be removed by using residue-free (=evaporating) cleaners. Suitable cleaning agents are ketones (acetone) or alcohols which are offered by the companies Loctite and 3M as quick cleaners. Make sure that the surface to be glued is dry and apply the stop with maximum pressure. Glueing should preferably be undertaken at temperatures between 20° to 30° Celsius and in dry atmosphere.

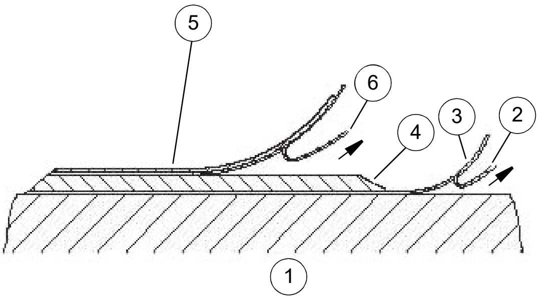
INFORMATION

When applying long pieces of magnetic strip do not immediately remove the complete protective foil, but rather peel back a short part from the end sufficient to fix the strip. Now align the strip. As the protective strip is then peeled back and out press the tape firmly onto the mounting surface. (a wallpaper roller wheel could be used to assist in applying pressure onto the magnetic strip when fixing it in position)

2.6.1 Installation steps

- Clean mounting surface (1) carefully.
- Remove protective foil (2) from the adhesive side of the magnetic strip (3).
- Stick down the magnetic strip (4).
- Clean surface of magnetic strip carefully.
- Remove protective foil (6) from adhesive tape on the cover strip (5).
- Fix cover strip (both ends should slightly overlap).

- Secure the overlapping ends of the cover against detachment.



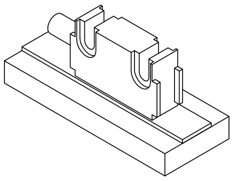
ATTENTION!

Do not expose the system to magnetic fields. Any direct contact of the magnetic strip with magnetic fields (e.g. adhesive magnets or other permanent magnets) is to be avoided. Sensor movements during power loss are not captured by the follower electronics.

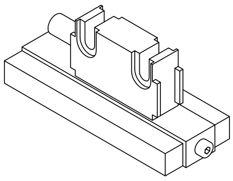
2.6.2 Installation examples

The simpler installation method using bevelled protective tape (☞ Img. 2-1:) is only to be recommended in thoroughly protected surroundings. In less protected mounting places the strip may peel. In such cases, mounts such as those shown in ☞ Img. 2-2: and ☞ Img. 2-3: are more suitable.

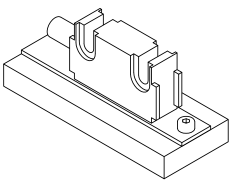
Optimal protection can be achieved by mounting in a groove (☞ Img. 2-4:) that is deep enough for the magnetic strip to be fully embedded.



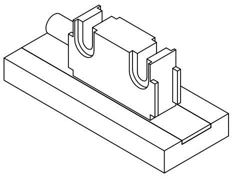
Img. 2-1:



Img. 2-2:



Img. 2-3:

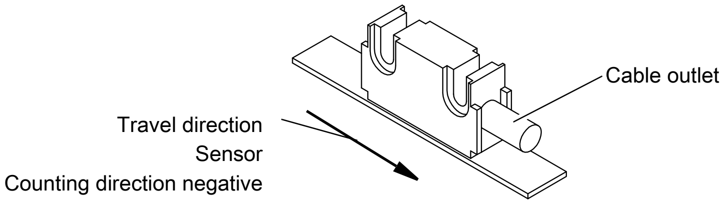


Img. 2-4:

2.6.3 Mounting the magnetic sensor

Use two M3 screws to fix the magnetic sensor. We recommend to use washers.

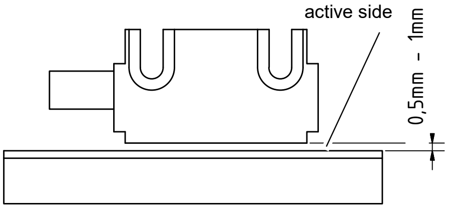
- Cable layout should avoid damages due to cable strain or other machine parts. If necessary use a drag chain or protective hose and provide for strain relief.
- Sensor must be aligned correctly with respect to the counting direction. This can be ignored if counting direction can be changed via the follower electronics.



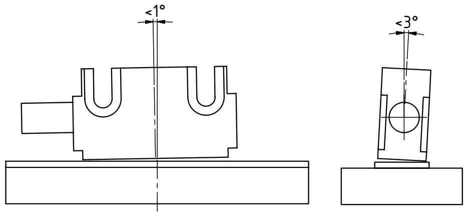
Img. 2-5: Definition of counting direction

- Distance measurements between sensor and magnetic tape and angular tolerances, must be maintained over the entire test section! (☞ Img. 2-6: to ☞ Img. 2-8:)

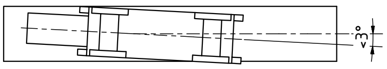
The max. gap without cover strip is 0.2 mm + 0.1 / -0mm. When using cover strip, the gap is reduced by the thickness of cover strip including its cover strip. The sensor may not touch the magnetic strip.



Img. 2-6: Gap Sensor / Magnetic Strip



Img. 2-7: Max. deviation



Img. 2-8: Alignment of sensor

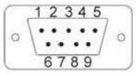
2.6.4 Trouble shooting

Below are some typical errors which may occur during installation and operation:

- The value shown on the display does not correspond to the actual value because the parameter setting for the counting resolution is set improperly.
- Magnetic strip incorrectly mounted (active surface must be mounted towards the sensor).
- To protect the magnetic tape the supplied cover tape was not used. Must always be non-magnetic.
- Sensor incorrectly connected. Check connection.
- Tolerance for the gap between magnetic sensor and magnetic strip not observed over the total travel distance, the sensor touches the magnetic tape (☞ Img. 2-6:) .
- Cable interruption / cut by sharp edges / cable squeezed.
- Sensor's active side not mounted towards the magnetic strip (☞ Img. 2-8: and ☞ Img. 2-8:)
- Sensor has not been aligned according to ☞ Img. 2-5: and ☞ Img. 2-7: .

2.7 Installation of ML measuring gibs

Plug pinout TTL differential signal



PIN No.	1	2	3	4	5	6	7	8	9	Shells
TTL differential signal	Blank	Z+	Select signal	B+	B-	0V	+5V	A+	A-	Shielding

NOTE !

The following statements describe the procedure for attachment of OPTIMUM ML-type absolute measuring glass scales.

Please follow the installation instructions and requirements accompanying the given component when installing incrementally measuring magnetic measurement systems from OPTIMUM, or for measurement systems from third-party manufacturers.

Depending on the attachment possibilities on your machine, mounting and connection to the machine axes may differ.

The following drawing should aid in selection of the required measuring gib lengths and description of the mounting situation.

ATTENTION!

Only use path-measuring systems recommended by OPTIMUM. When assembling the path-measuring systems imperatively follow the instructions of the manufacturer.

NOTE !

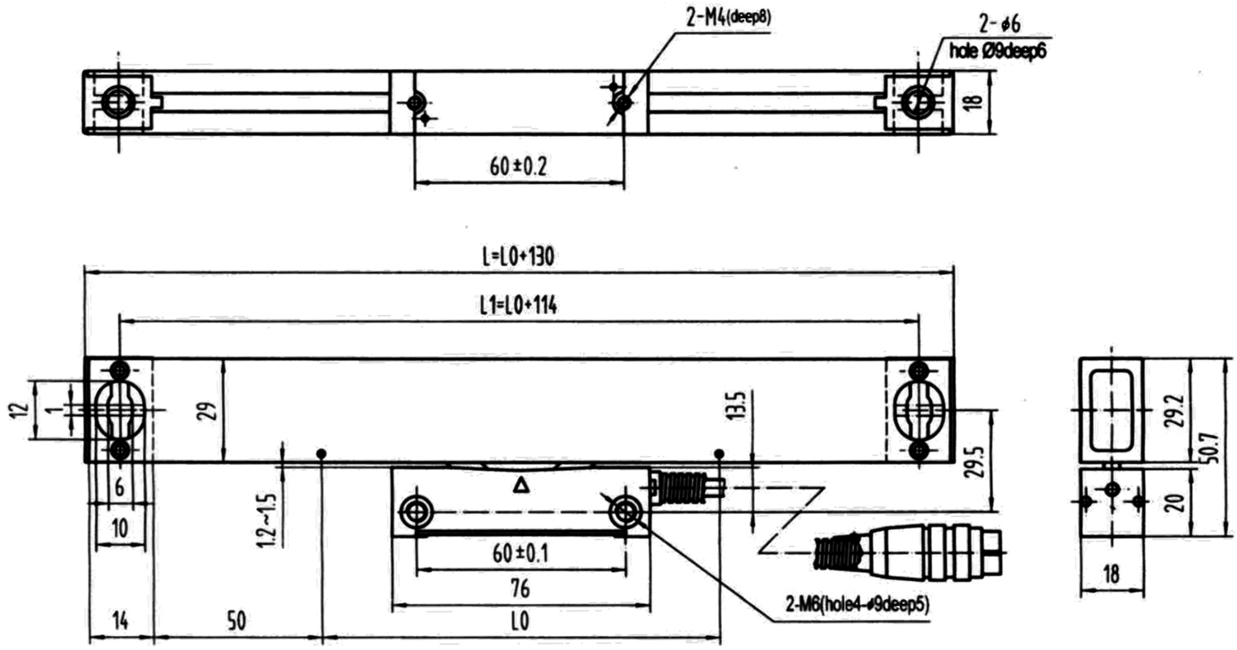
The path-measuring system and its add-on pieces can cover important components on the machine tool (e.g. lubricating nipples).

Before mounting the path-measuring systems, please take note of any such limitations in functions and make arrangements accordingly.

2.7.1 Assembly of the measurement gib housing

- → Before mounting it on the machine, check the operability of the measuring gauges. To do so, use the DRO or a similar device.
- → Install the measuring gauge in a way that it will not be damaged by cutting tools or coolants. If required, mount a cover or drip moulding.

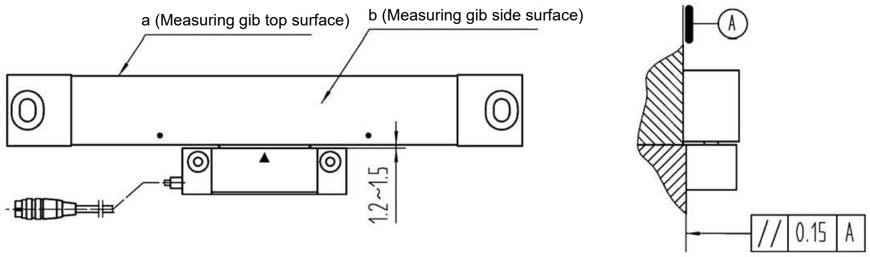
Measuring length	L_0 (mm)	**50～500mm**
Mounting length	L_1 (mm)	**$L_1 = L_0 + 2\ (50+7) = L_0 + 114$**
Total length	L (mm)	**$L = L_0 + 2\ (50+15) = L_0 + 130$**



- → If possible, mount the enclosed measuring gauge with the sealing lips showing downward.
- → If possible, place the reading head stationary in order to avoid damages of the connection lines by its movements.

2.7.2 Assembly of the reading head

The measuring gib and sensor head are to be mounted separately on parts of the machine which are movable in relation to one another. The fixed and movable parts of the machine must correspond to the requirements and maximum tolerances as given in ☞ Img. 2-9: .



Img. 2-9:

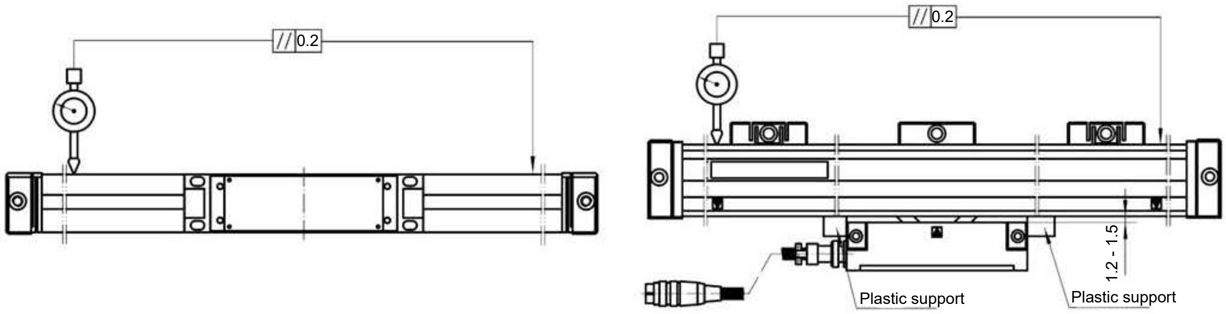
- → Check the measuring gib mounting level as shown in ☞ Img. 2-9: .
- → Mount a fixture for the reading head.
- → Fix the reading head to the fixture.

→ Check the orientation of the reading head using a dial gauge.

→ The parallel error between the orthogonal side surfaces of the measuring gib and the machine-tool guide must be less than 0.2mm across the entire range. ☞ Img. 2-10:

→ The maximum gap between the two parallel surfaces of the measuring gib and the sensor head is 1.2 to 1.5mm.

→ After installation of the measuring gib, remove the plastic support.



Img. 2-10:

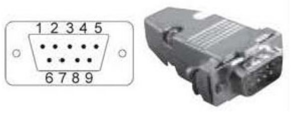
2.7.3 Trouble shooting

Below are some typical errors which may occur during installation and operation:

- The value shown on the display does not correspond to the actual value because the parameter setting for the counting resolution is set improperly. ► Factory Settings: on page 20
- Reading head is incorrectly connected. Check connection.
- The gap tolerance between measuring head and measuring gib was not maintained across the entire measurement range ☞ Img. 2-10:
- Cable interruption / cut by sharp edges / cable squeezed.
- Moisture has penetrated extension cable plugs.
- Travel speed is too high; it should not exceed 0.5 meters per second.
- The replacement measuring gib is not from the same manufacturer as the original measuring gib. The actual counting resolution of the measuring gib does not correspond to the set value.

2.8 Installation of ball scales

Plug pinout ball scales signal



PIN No.	1	2	3	4	5	6	7	8	9	Shells
Ball scales signal	+12V	E+	Blank	E-	S	0V	Blank	Blank	Blank	Shielding

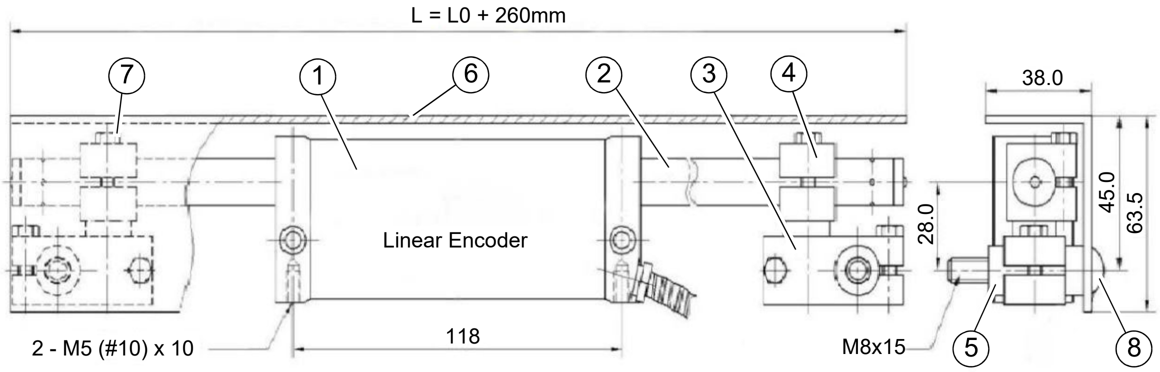
Ball scales are already protected against dust and dirt in their design. Nevertheless, protection against external mechanical influences should be provided. Avoid strong temperature fluctuations, shock or vibration.

The mounting surface / measuring track must be flat. Buckles or bumps will lead to measuring inaccuracies.

For technical reasons the ball scale should be longer than the actual measuring distance.

2.8.1 Assembly of the ball scales

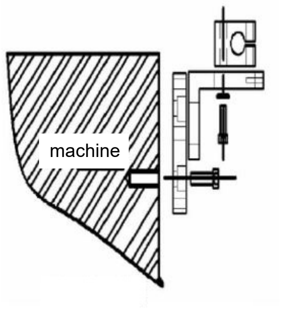
Measuring length L0 (mm)	51 mm - 11000 mm
Total length L (mm)	L = L0 + 260 mm



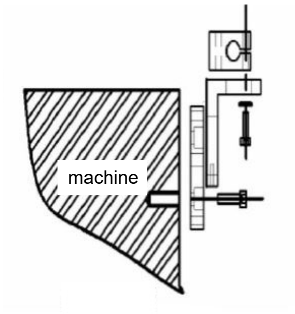
Pos.	Designation	Pos.	Designation
1	Reading head	2	Ball scale
3	Connection block for supporting scale and fixture	4	Fixed block for scale and fixture
5	Installation column for scale	6	Cover plate for scale and fixture
7	M5 x 20 screw	8	M8 screw

2.8.2 Installation examples

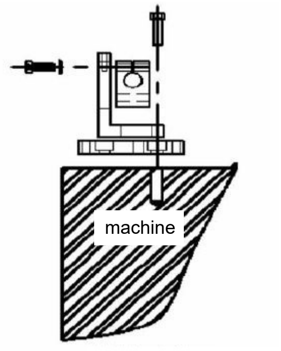
Choose any mounting type according to installation space of the machine.



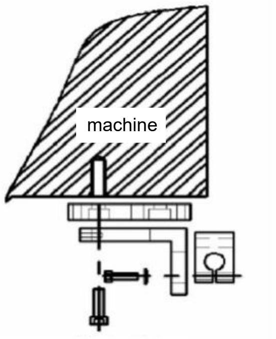
Img. 2-11:



Img. 2-12:



Img. 2-13:



Img. 2-14:

2.8.3 Necessary measures

- The system should be positioned well away from cables with interference; if necessary a **protective screen or metal housing must be provided.** The running of wiring parallel to the mains supply should be avoided.
- Contactor coils must be wired with spark suppression.

3 Operation DPA31

3384030

3384031

When the device is switched on, the DRO starts a self-check.

After the self-check is completed, the DRO changes to the normal indicator status.

The DRO displays the last data before it is switched off.

- The selected coordinates and the selected tool.
- The metric or Anglo-American measurement system.
- The last displayed values.

3.1 Parameter settings

- Press the **Prog 3sec** key for 3 seconds until the X-axis display shows P-10.
- To cancel an entry, press the **CE** button.
- Press button **ENT** to save an input.

3.1.1 Explanation of the Parameters

Meanings of parameters and settings.

Parameters	Axis	Description
P -- 07	X axis	Accuracy of representations on the display: When a higher representational accuracy value than the actual countingresolution is set on the display, the representational accuracy value willbe shown accordingly.
P -- 08	Z_0 /Y axis	
P -- 09	Y axis	
P -- 10	X axis	Counting direction: The counting direction of the measurement in the positive or negative direction. 0 for a positive counting direction, 1 for a negative counting direction.
P -- 11	Z_0 /Y axis	
P -- 12	Z axis	
P -- 13	X axis	Counting resolution of the respective axis. The unit is 0.1 mm. Relation: **O** 5µm = 50 **O** 2µm = 20 **O** 10µm = 100 The counting resolution set must correspond to the selected measuringgib or active measuring strip reading device. When a higher representational accuracy value than the actual countingresolution is set on the display, the representational accuracy value willbe shown accordingly.
P -- 14	Z_0 /Y axis	
P -- 15	Z axis	
P -- 16	X axis	Correction factor: Linear error compensation coefficient. The value range for linear error compensation coefficients extends from -9.999 to 9.999mm, and gives the value to be adjusted per meter.
P -- 17	Z_0 /Y axis	
P -- 18	Z axis	
P -- 19	Rotation Speed Signal	The target value of the number of pulses per revolution of the rotationspeed signal. The number of impulses per revolution of the rotation speed signal depends on the number of output pulses per revolution of the transducer in use (number of permanent magnets). The greater this value is, the higher will be the resolution of the revolution speed. The range of possible setting values extends from 1 to 3600.
P -- 20		Measurement time: The target value of the time for speed measurement. The maximum set value is 10 (i.e. 1 second) and the minimum set value is 1 (i.e. 0.1 second). The greater this value is, the higher will be the resolution of the revolutionspeed, and the slower this value will be refreshed. The representational accuracy of the rotational speed indicator showndirectly on the display = 600 / (number of impulses per revolution x measurement time)

Factory Settings:	
Where delivered as a standalone device.	In applied delivery state with machine tool. Please record the values before making any changes.
P -- 13 = 50	P -- 07 =
P -- 14 = 50	P -- 08 =
P -- 15 = 50	P -- 09 =
	P -- 10 =
	P -- 11 =
	P -- 12 =
	P -- 13 =
	P -- 14 =
	P -- 15 =
	P -- 16 =
	P -- 17 =
	P -- 18 =
	P -- 19 =
	P -- 20 =

3.2 Description of the Keys

Letter/Symbol on the Key	Name of the key	Function description
X	X axis key	To select the X coordinate axis
Z	Y axis key	To select the Y coordinate axis
YZ0	Z0/Y-axis key (3 axes)	To select the Z0/Y coordinate axis

+/- 7 8 9 • 4 5 6 0 1 2 3	Plus and minus signs with numerical keys and decimal point	For input of negative or positive signs. For numeric entry. For input of decimal places; decimal point
CE	Delete key	To clear displayed value of a specific axis or to jump back to coordinate points.
ENT	Enter key	To confirm the data input
R/D	Radius or Diameter	X-axis display when used on lathes
mm in	Shift key Metric / inches	Display of values o in the metric system o in the Anglo-American measurement system
Ref	Reference marker function	for setting relative coordinates ► Reference marker function on page 23
▲	Machine zero point	for setting an absolute zero-point in the coordinate system ► Machine zero point function on page 23
Sz	Z+Z0 key (3 axes)	For display of the Z+Z0 value Z and Z0 are added
Prog 3sec	Programming key	For internal parameter settings ► Parameter settings on page 18
Cal	The calculator function key	► Calculator function on page 24

+	Addition	► Calculator function on page 24
−	Subtraction	
×	Multiplication	
÷	Division	
⟋	Coordinate points along a diagonal line	► Functions for milling machines on page 25
❂	Coordinate points on a circle	► Coordinate Points on a Circle or Arc on page 26
	Inclined plane function	► Inclined Plane on page 29
	Arc function	► Arc on page 30
No.	Tool data function	► Functions for milling machines and lathes on page 33 ► Recall of tool data on page 33

3.3 Reference marker function

Set a zero point with preset axis values. Set a relative coordinate system based on current machine position.

- Press the button Ref to activate the reference marker function.

  The LED flashes.
- Press the button Ref to exit from the Reference marker function.
- The set reference mark values are now transferred to the axis display.

Example:

Setting the values.

After pressing the reference mark function, the following values should be set: 0.500 for the X axis, 10 for the Y-axis, and 0 for the Z-axis.

Press the following keys in the order shown in order to set these values.

Ref X 0 • 5 ENT

Y Zo 1 0 ENT

Z 0 ENT Ref

3.4 Machine zero point function

For the setting of an absolute zero point.

Press the button ▲. The LED flashes.

The axis values shown for the current machine position are reset to zero. Values for the axes may also be input where needed.

When the machine zero point is turned off, the previous values are shown again.

3.5 Calculator function

Add, subtract, multiply and divide.

- Press button Cal to start the calculator. The LED lights up.

  The number field of the rotation speed indicator is used as the input- and result field.

- To exit from the Calculator function, press the Cal button.

Keys

- + to add. − to subtract. × to multiply.

  ÷ to divide.

Example:

Press the following keys in the order shown in order to divide the number 46.2 by 2, and transfer the result to the Z axis.

Cal 4 6 • 2 ÷ 2 ENT Z

3.6 Functions for milling machines

3.6.1 Coordinate points along a diagonal line

Creates a line within a coordinate system, along which a specified number of uniformly spaced coordinate points are defined.

- The parameters are displayed in the Rotation Speed field.
- The last value entered for each parameter is displayed in the X axis row.
- Enter new values in the Y axis row.

Entering the Parameters

Parameters	Description
1 - 1 L_A	Angle of the line on the coordinate axis: X-Y
2 - 1 L_A	Angle of the line on the coordinate axis: Y-Z
3 - 1 L_A	Angle of the line on the coordinate axis: X-Z
Press the key to select X-Y, Y-Z or X-Z as the coordinate axis. To enter the angle of the line, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 2 L_d	Length of the line: X-Y
2 - 2 L_d	Length of the line: Y-Z
3 - 2 L_d	Length of the line: X-Z
To enter the length of the line, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 3 LΠo.H	Number of coordinate points: X-Y
2 - 3 LΠo.H	Number of coordinate points: Y-Z
3 - 3 LΠo.H	Number of coordinate points: X-Z
To enter the number of coordinate points, use the numeric keys and confirm with the ENT key.	

Positioning the Coordinate Points

Parameters	Description
1LHo	Coordinate point no.: X-Y
2LHo	Coordinate point no.: Y-Z
3LHo	Coordinate point no.: X-Z

To select the desired coordinate point, press the ENT button.

To select the previous coordinate point, press the CE button.

Then move the machine axes until the positions of the selected coordinate point show 0.000.

INFORMATION

Press the button 0 to temporarily interrupt the function. The display returns to the normal display status. Press the 0 key again to continue with the function.

To exit from the function, press the ⟋ button.

3.6.2 Coordinate Points on a Circle or Arc

Creates a circle or arc within a coordinate system, along which a specified number of uniformly spaced coordinate points are defined.

The set coordinate points on the circle or arc run counter clockwise. Coordinate point 2 is located counter clockwise of coordinate point 1.

- The parameters are displayed in the Rotation Speed field.
- The last value entered for each parameter is displayed in the X axis row.
- Enter new values in the Y axis row.

Entering the Parameters

Parameters	Description
1 - 1 CCEΠ	Coordinate plane of the circle: X-Y
2 - 1 CCEΠ	Coordinate plane of the circle: Y-Z
3 - 1 CCEΠ	Coordinate plane of the circle: X-Z
To select X-Y, Y-Z or X-Z as the coordinate plane, press the ⎈ key. To enter the midpoint of the circle on the coordinate plane, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 2 C_d	Diameter of the circle or arc in the coordinate plane: X-Y
2 - 2 C_d	Diameter of the circle or arc in the coordinate plane: Y-Z
3 - 2 C_d	Diameter of the circle or arc in the coordinate plane: X-Z
To enter the diameter of the circle or arc, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 3 CΠo.H	Number of coordinate points: X-Y
2 - 3 CΠo.H	Number of coordinate points: Y-Z
3 - 3 CΠo.H	Number of coordinate points: X-Z
To enter the number of coordinate points, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 4 5_A	Start angle: X-Y
2 - 4 5_A	Start angle: Y-Z
3 - 4 5_A	Start angle: X-Z
To enter the start angle on the coordinate plane, use the numeric keys and confirm with the ENT key.	

Parameters	Description

1 - 5 E_A	End angle: X-Y
2 - 5 E_A	End angle: Y-Z
3 - 5 E_A	End angle: X-Z
To enter the end angle on the coordinate plane, use the numeric keys and confirm with the ENT key.	

Positioning the Coordinate Points

Parameters	Description
1CHo	Coordinate point no.: X-Y
2CHo	Coordinate point no.: Y-Z
3CHo	Coordinate point no.: X-Z
To select the desired coordinate point, press the ENT button. To select the previous coordinate point, press the CE button. Then move the machine axes until the positions of the selected coordinate point show 0.000.	

INFORMATION

Press the button 0 to temporarily interrupt the function. The display returns to the normal display status. Press the 0 key again to continue with the function.

To exit from the function, press the ⎈ button.

3.6.3 Inclined Plane

Creates an inclined plane in a coordinate system such that processes can be carried out on said inclined plane.

- The parameters are displayed in the Rotation Speed field.
- The last value entered for each parameter is displayed in the X axis row.
- Enter new values in the Y axis row.

Entering the Parameters

Parameters	Description
1 - 1 CL_A	Angle of the inclined plane on the coordinate plane: X-Y
2 - 1 CL_A	Angle of the inclined plane on the coordinate plane: Y-Z
3 - 1 CL_A	Angle of the inclined plane on the coordinate plane: X-Z
To select X-Y, Y-Z or X-Z as the coordinate plane, press the key. To enter the angle of the inclined plane, use the numeric keys and confirm with the ENT key.	

Positioning to a Coordinate Point on the Inclined Plane

Parameters	Description
1A _angle entered	Inclined plane: X-Y
2A_angle entered	Inclined plane: Y-Z
3A_angle entered	Inclined plane: X-Z

Then move the machine axes of the plane until the positions of the selected coordinate plane read 0.000.

INFORMATION

Press the button 0 to temporarily interrupt the function. The display returns to the normal display status. Press the 0 key again to continue with the function.
To exit from the function, press the button.

3.6.4 Arc

Creates an arc in a coordinate system such that processes can be carried out on said arc.

- The parameters are displayed in the Rotation Speed field.
- The last value entered for each parameter is displayed in the X axis row.
- Enter new values in the Y axis row.

Entering the Parameters

Parameters	Description
1 - 1 ACE⊓	Midpoint of the arc on the coordinate plane: X-Y
2 - 1 ACE⊓	Midpoint of the arc on the coordinate plane: Y-Z
3 - 1 ACE⊓	Midpoint of the arc on the coordinate plane: X-Z
To select X-Y, Y-Z or X-Z as the coordinate plane, press the key. To enter the end midpoint of the arc, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 2 5E_d	Radius of the arc on the coordinate plane: X-Y
2 - 2 5E_d	Radius of the arc on the coordinate plane: Y-Z
3 - 2 5E_d	Radius of the arc on the coordinate plane: X-Z
To enter the end radius of the arc, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 3 0U_S	Machining mode of the arc on the coordinate plane: X-Y
2 - 3 0U_S	Machining mode of the arc on the coordinate plane: Y-Z
3 - 3 0U_S	Machining mode of the arc on the coordinate plane: X-Z
To set machining mode of the arc, use the numeric keys 0 or 1. 0 = Machining mode of the arc from the inside. 1 = Machining mode of the arc from the outside. Confirm with the ENT key.	

Parameters	Description
1 - 4 CU_d	Milling tool diameter: X-Y
2 - 4 CU_d	Milling tool diameter: Y-Z
3 - 4 CU_d	Milling tool diameter: X-Z
To enter the diameter of the milling tool, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 5 S_Po	Start position: X-Y
2 - 5 S_Po	Start position: Y-Z
3 - 5 S_Po	Start position: X-Z
To enter the start position, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 6 E_Po	End position: X-Y
2 - 6 E_Po	End position: Y-Z
3 - 6 E_Po	End position: X-Z
To enter the end position, use the numeric keys and confirm with the ENT key.	

Parameters	Description
1 - 7 CUF	Machining depth: X-Y
2 - 7 CUF	Machining depth: Y-Z
3 - 7 CUF	Machining depth: X-Z
To enter the machining depth, use the numeric keys and confirm with the ENT key.	

Positioning to a Coordinate Point on the Arc

Parameters	Description
1Po	Position: X-Y
2Po	Position: Y-Z
3Po	Position: X-Z
To select the desired coordinate point, press the ENT button. To select the previous coordinate point, press the CE button. Then move the machine axes until the positions of the selected coordinate point show 0.000. Repeat these steps until the arc has been completely machined.	

INFORMATION

Press the button 0 to temporarily interrupt the function. The display returns to the normal display status. Press the 0 key again to continue with the function.
To exit from the function, press the button.

3.7 Functions for milling machines and lathes

3.7.1 Tool Data Function

Creates up to 99 tool data sets in relation in the coordinate system.

Usage of the tool data function makes it possible to establish a specific relationship between the tool data in the coordinate system and the displayed values.

INFORMATION

The Save function for tool data only works when the Reference Mark function is activated.

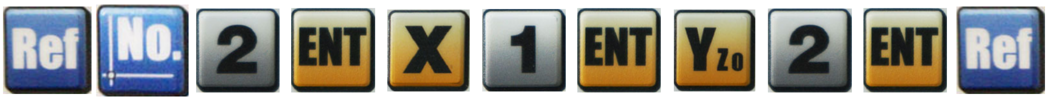
► Reference marker function on page 23.

Saved values remain even by loss of electric power.

Example:

Tool data no. 2 should lie at X = 1.000 and Y = 2.000 to the shown values.

Press the following keys in the order shown in order to input the values X = 1.000 and Y = 2.000 under tool data no. 2.

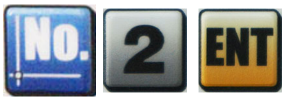


3.7.2 Recall of tool data

Example:

The tool data set no. 2 should be used at the currently displayed position.

Press the following keys in the order shown in order to use tool data set no. 2.



4 Appendix

4.1 Copyright

This document is protected by copyright. All derived rights are reserved, especially those of translation, re-printing, use of figures, broadcast, reproduction by photo-mechanical or similar means and recording in data processing systems, either partial or total.

Subject to technical changes without notice.

4.2 Liability claims/warranty

Beside the legal liability claims for defects of the customer towards the seller, the manufacturer of the product, OPTIMUM GmbH, Robert-Pfleger-Straße 26, D-96103 Hallstadt, does not grant any further warranties unless they are listed below or were promised in the framework of a single contractual provision.

- The processing of the liability claims or of the warranty is performed as chosen by OPTIMUM GmbH either directly or through one of its dealers.
  Any defective products or components of such products will either be repaired or replaced by components which are free from defects. Ownership of replaced products or components is transferred to OPTIMUM Maschinen Germany GmbH.
- The automatically generated original proof of purchase which shows the date of purchase, the type of machine and the serial number, if applicable, is the precondition in order to assert liability or warranty claims. If the original proof of purchase is not presented, we are not able to perform any services.
- Defects resulting from the following circumstances are excluded from liability and warranty claims:
  - Using the product beyond the technical options and proper use, in particular due to overstraining of the machine.
  - Any defects arising by one's own fault due to faulty operations or if the operating manual is disregarded.
  - Inattentive or incorrect handling and use of improper equipment
  - Unauthorized modifications and repairs
  - Insufficient installation and safeguarding of the machine
  - Disregarding the installation requirements and conditions of use
  - atmospheric discharges, overvoltage and lightning strokes as well as chemical influences
- Neither are the following items covered by liability or warranty claims:
  - Wearing parts and components which are subject to normal and intended wear, such as V-belts, ball bearings, lighting, filters, seals, etc.
  - Non reproducible software errors
- Any services, which OPTIMUM GmbH or one of its agents performs in order to fulfil any additional warranty are neither an acceptance of the defects nor an acceptance of its obligation to compensate. These services neither delay nor interrupt the warranty period.
- The court of jurisdiction for legal disputes between businessmen is Bamberg.
- If any of the aforementioned agreements is totally or partially inoperative and/or invalid, a provision which nearest approaches the intent of the guarantor and remains within the framework of the limits of liability and warranty which are specified by this contract is deemed agreed.

4.3 Advice for disposal / Options of reuse:

Please dispose of your machine in an environmentally friendly way, not by disposing of the waste not in the environment, but by acting in a professional way.

Please neither throw away the packaging nor the used machine later on, but dispose of them according to the guidelines established by your city council/municipality or by the corresponding waste management enterprise.

4.3.1 Decommissioning

CAUTION!

Used devices need to be decommissioned in a professional way in order to avoid later misuses and endangerment of the environment or persons.

- **Unplug the power cord.**
- **Cut the connection cable.**
- **Remove all operating materials from the used device which are harmful to the environment.**
- **If applicable remove batteries and accumulators.**
- **Disassemble the machine if required into easy-to-handle and reusable assemblies and component parts.**
- **Dispose of machine components and operating fluids using the intended disposal methods.**

4.3.2 Disposal of new device packaging

All used packaging materials and packaging aids from the machine are recyclable and generally need to be supplied to the material reuse.

The packaging wood can be supplied to the disposal or the reuse.

Any packaging components made of cardboard box can be chopped up and supplied to the waste paper collection.

The films are made of polyethylene (PE) and the cushion parts are made of polystyrene (PS). These materials can be reused after reconditioning if they are passed to a collection station or to the appropriate waste management enterprise.

Only forward the packaging materials correctly sorted to allow direct reuse.

4.3.3 Disposal of the old device

INFORMATION

Please take care in your interest and in the interest of the environment that all component parts of the machine are only disposed of in the intended and admitted way.

Please note that the electrical devices comprise a variety of reusable materials as well as environmentally hazardous components. Please ensure that these components are disposed of separately and professionally. In case of doubt, please contact your municipal waste management. If appropriate, call on the help of a specialist waste disposal company for the treatment of the material.

4.3.4 Disposal of electrical and electronic components

Please make sure that the electrical components are disposed of professionally and according to the statutory provisions.

The device is composed of electrical and electronic components and must not be disposed of as household waste. According to the European Directive regarding electrical and electronic used devices and the implementation of national legislation, used power tools and electrical machines need to be collected separately and supplied to an environmentally friendly recycling centre.

As the machine operator, you should obtain information regarding the authorised collection or disposal system which applies for your company.

Please make sure that the electrical components are disposed of professionally and according to the legal regulations. Please only throw depleted batteries in the collection boxes in shops or at municipal waste management companies.

4.4 Disposal via municipal collection facilities

Disposal of used electrical and electronic components
(Applicable in the countries of the European Union and other European countries with a separate collecting system for those devices).

The sign on the product or on its packing indicates that the product must not be handled as common household waste, but that is needs to be disposed of at a central collection point for recycling. Your contribution to the correct disposal of this product will protect the environment and the public health. Incorrect disposal constitutes a risk to the environment and public health. Recycling of material will help reduce the consumption of raw materials. For further information about the recycling of this product, please consult your District Office, municipal waste collection station or the shop where you have purchased the product.

4.5 Change information manual

Chapter	Short note	new version no.
0 ; 3	Images for different DPA31	1.0.1

4.6 Product follow-up

We are required to perform a follow-up service for our products which extends beyond shipment.

We would be grateful if you could send us the following information:

- Modified settings
- Any experiences with the DPA31 which might be important for other users
- Recurring malfunctions

Optimum Maschinen Germany GmbH
Dr.-Robert-Pfleger-Str. 26

D-96103 Hallstadt

Fax +49 (0) 951 - 96555 - 888
email: info@optimum-maschinen.de

EC Declaration of Conformity

according EMC Directive 2014/30/EC

The manufacturer / distributor: Optimum Maschinen Germany GmbH
Dr.-Robert-Pfleger-Str. 26
D - 96103 Hallstadt

hereby declares that the following product

Product designation: Digital position display

Type designation: DPA 31

Digital position display for using on machine tools for path measurement in conjunction with magnetic sensors, glass rulers or ball rulers which meet all the relevant provisions of the above mentioned Directive 2014/30/EC including their amendments in force at the time of declaration. The safety objective meet the requirement of directive.

The following additional EU Directives have been applied:

Restriction of the use of certain hazardous substances in electrical and electronic equipment 2015/863/EU

Responsible for documentation: Kilian Stürmer, phone: +49 (0) 951 96555 - 800

Address: Dr.-Robert-Pfleger-Str. 26, D - 96103 Hallstadt

Kilian Stürmer
(CEO, General manager)
Hallstadt, 2019-12-11